In the Claims

Claims 1-8 are pending in the application.

Claims 1, 2, 4-7 are rejected.

Claims 3 and 8 are objected to.

RECEIVED
CENTRAL FAX CENTER
DEC 12 2006

Explanation of Amendments in the Claims:

CLAIMS:

1. (currently amended) ~~In a~~ A method of including at least one impermeable object in a fluid simulation where a state of a fluid ~~comprising~~ comprised of velocities is updated ~~in the presence of impermeable objects having surfaces~~ in a given region over discrete time steps by:

dividing the region into cells comprising a regular grid and then defining a velocity field which ~~associated~~ associates a velocity vector with each cell; and

recalculating the velocity field at each consecutive time step based on the state of the fluid on the previous time step and ~~the~~ an effect of said at least one impermeable object ~~surfaces~~ via Navier-Stokes equations comprising calculation of advection and pressure effects;

the ~~improvement~~ method of including said at least one impermeable object comprising:

identifying surfaces of said at least one impermeable object in the given region to define cells contained within said at least one impermeable object and to define closest fluid containing cells within the fluid;

assigning a value to the velocity vectors, associated with the cells contained within ~~the~~ said at least one impermeable ~~objects~~ object when the velocity field is used for the calculation of the advection and pressure effects, which is copied from the closest fluid containing cell; and

when the value includes a normal component which would cause motion of the fluid into ~~the~~ said at least one impermeable object, removing the normal component.

2. (currently amended) The method according to Claim 1 wherein ~~the~~ said at least one impermeable object has ~~objects have~~ velocities defined on ~~their~~ the surfaces of said at least one impermeable object, the method including:

determining ~~the~~ a relative velocity by taking the difference between the velocity from the closest fluid containing cell and the velocity from ~~the~~ a nearest surface of said at least one impermeable object ~~surface~~; and

removing the normal component which would cause motion of the fluid into ~~the~~ said at least one impermeable object by taking ~~the~~ a dot product of the relative velocity with ~~the~~ a surface normal of ~~the~~ a nearest impermeable object surface, and when it is negative, adding to the velocity vector, a vector which has a magnitude of the dot product times ~~the~~ a magnitude of the velocity vector and which points in ~~the~~ a direction of the surface normal of the nearest impermeable object surface.

3. (currently amended) The method according to Claim 1 wherein a fluid volume including a fluid surface defined by level set values representing ~~the~~ a distance to the surface is advected according to the ~~velocities~~ velocity vectors, the method including:

storing velocity data only for those cells which are inside or near the fluid volume; and

storing level set values only for those cells which are near the fluid surface.

4. (currently amended) The method according to Claim 1 including:

<u>defining said at least one impermeable object as a level set with level set values representing a signed distance to a nearest surface of said at least one impermeable object, in conjunction with a velocity field comprising the velocities of a nearest surface; and</u>

obtaining <u>velocities of the surface of said at least one</u> ~~the~~ impermeable object ~~surface velocities~~, ~~the~~ <u>and normals of the surface of said at least one</u> impermeable object ~~surface normals~~; and

determining whether a cell is inside or outside of ~~the~~ <u>said at least one</u> impermeable ~~objects~~ <u>object</u> using the level set and <u>the</u> velocity field~~ as described in Claim 7~~.

5. (currently amended) The method according to Claim 1, including:

obtaining the velocity <u>vector</u> from the closest fluid cell by extrapolating the ~~velocities~~ <u>velocity vectors</u> from the cells just outside the ~~impermeable object~~ surface <u>of said at least one impermeable object</u> into the cells inside the <u>surface of said at least one</u> impermeable object ~~surface~~ satisfying ~~the~~ <u>a</u> constraint that the gradient of the extrapolated ~~velocities~~ <u>velocity vectors</u> along ~~the~~ <u>a normal</u> direction of the ~~impermeable object~~ surface <u>of said at least one impermeable object</u> is zero.

6. (currently amended) The method according to Claim 1 wherein ~~the~~ <u>said at least one</u> impermeable ~~objects~~ <u>object</u> may be deforming and including a transformation along a path, the method including:

computing the velocity vectors of the surface of said at least one impermeable object ~~surface velocities~~ as the sum of ~~the~~ a velocity caused by the transformation along the path and ~~the~~ a velocity caused by the deforming of the object surface.

7. (currently amended) ~~In a~~ A method of including at least one impermeable object in a fluid simulation where a state of a fluid is updated ~~in the presence of impermeable objects having surfaces~~ in a given region over discrete time steps by:

dividing the region into cells comprising a regular grid; and

recalculating the fluid state at each consecutive time step based on the state of the fluid on the previous time step and ~~the~~ an effect of said at least one impermeable object ~~surfaces~~ via Navier-Stokes equations;

the ~~improvement~~ method of including said at least one impermeable object comprising:

identifying surfaces of said at least one impermeable object in the given region;

defining ~~the~~ said at least one impermeable ~~objects~~ object as a level set with level set values representing ~~the~~ a signed distance to ~~the~~ a nearest surface of said at least one impermeable object ~~objects surface~~, in conjunction with a velocity field comprising ~~the~~ velocities of the ~~neareast~~ nearest surface of said at least one impermeable object ~~surface~~.

8. (currently amended) The method according to Claim 7 including:

storing level set values only for those cells which are near the surface of said at least one impermeable object ~~surface~~; and

storing velocity values only for those cells which are near the surface of said at least one impermeable object ~~surface~~.

9. (new) In a method of fluid simulation where state of a fluid is updated in the presence of impermeable objects having surfaces in a given region over discrete time steps by:

dividing the region into cells comprising a regular grid; and

recalculating the fluid state at each consecutive time step based on the state of the fluid on the previous time step and the effect of impermeable object surfaces via Navier-Stokes equations;

the improvement comprising:

defining the impermeable objects as a level set with level set values representing a signed distance to a nearest surface of the impermeable objects, in conjunction with a velocity field comprising velocities of the nearest surface of the impermeable objects;

storing level set values only for those cells which are near the surface of the impermeable objects; and

storing velocity values only for those cells which are near the surface of the impermeable objects.